

REMARKS

Claims 1-18 are pending and have been rejected. Claims 1, 11, 12 and 14 have been amended herein. In view of the following remarks, it is respectfully requested that the present application be passed to issuance.

Claims 11 and 13-18 have been rejected under 35 U.S.C. §102(e) as being anticipated by Cheng, *et al.* (U.S. Patent Application Publication 2002/0182826). Applicant respectfully traverses this rejection.

Claim 11, as amended, specifically requires "forming a liner layer in the trench, [and] after forming the liner layer, implanting fluorine into upper top corners of the trench." It is respectfully submitted the reference by Cheng, *et al.* does not teach or suggest the limitations of claim 11.

As noted by the Examiner, Cheng, *et al.* does not teach implanting fluorine after forming the liner layer. See paragraph 15 of the Office Action. But the Examiner concludes that it would be obvious to modify the process by Cheng, *et al.* and form the liner layer before implanting the fluorine. Applicant respectfully disagrees with this conclusion.

In the Office Action, the Examiner states that it would have been obvious to one of ordinary skill in the art to substitute forming the oxidation layer then implanting F₂ into the upper top corners of the STI liner oxidation because the thickness of the oxidation layer would prove to be equivalent due to the fact that whether the fluorine ions are implanted into the upper corners of the trench at an angle before or after the oxidation layer is formed would still increase the thickness of the oxidation layer. Applicant respectfully submits that this conclusion is in direct contradiction to the actual teachings of Cheng, *et al.*

For example, Cheng, *et al.* explicitly teaches that "the area around the top corner 314 of the trench 306, where fluorine ions are implanted, oxidizes faster than other area without the implantation of fluorine ions." Par. [0020]. If the oxidation was performed prior to forming the fluorine ions, then the thicker layer would not be formed. In fact, Cheng, *et al.* teaches just that. "A thicker oxide layer is thus formed at the area where fluorine ions are implanted than at the area where fluorine ions are absent." Par. [0020]. See also, par. [0021] ("Since the substrate 300 around the top corner 314 of the trench 306 comprises fluorine ions, the rate of oxidation increases to form a liner oxide layer 312 with a greater thickness than at other area."). As a result, Cheng, *et al.* simply does not teach that the fluorine formed after the liner layer would somehow increase the thickness of the liner.

Therefore, it is respectfully submitted that Cheng, *et al.* does not teach or suggest the invention of claim 11.

Claims 12, 13 and 15-18 each depend from claim 11 and add further limitations. It is respectfully submitted that these dependent claims are allowable by reason of depending from an allowable claim as well as for adding additional limitations.

Claim 14 has been amended to be placed into independent form. This claim, as filed with the RCE, specifically recites "implanting fluorine in sufficient amounts to affect reduction of negative bias temperature stability and enhance gate oxidation at the STI corner." It is respectfully submitted that the reference by Cheng, *et al.* does not teach or suggest the limitations of claim 14. In particular, the Examiner has not cited, nor can Applicant find, any recitation whatsoever that Cheng, *et al.* implants fluorine in sufficient amounts to affect reduction of negative bias temperature and stability or enhance gate oxidation at the STI corner. Rather, Cheng, *et al.* teaches that "the dosage of implantation for the tilt-angled fluorine ion implantation

can be adjusted according to the desired thickness and location of the oxide layer." Par. [0020].

Therefore, it is respectfully submitted that claim 14 is not anticipated by the Cheng, *et al.* reference.

Claims 1-10 and 12 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Cheng, *et al.* Applicant respectfully traverses this rejection.

Claim 1, as filed in the RCE, specifically recites "after forming the STI region and forming liner layer, implanting F₂ into upper top corners of said STI liner oxidation layer at a large tilted angle in sufficient amounts to affect reduction of negative bias temperature instability and enhance gate oxidation at the STI corner after a high density plasma fill of said STI F₂ implanted liner oxidation layer." Applicant respectfully submits the references of record do not teach or suggest the limitations of claim 1.

Cheng, *et al.* provides absolutely no suggestion for implanting fluorine prior to forming the liner layer. In fact, the entire purpose of implanting the fluorine is to affect the formation of the liner. See Cheng, *et al.*, par. [0026] ("When the thermal process is conducted to form the liner layer on the surface of the trench, the trench surface with the fluorine ions oxidizes at a faster rate, a thicker liner layer is thus formed around the top corner of the trench than at other area."). If the liner was formed prior to implanting fluorine, then the thicker layer would not be formed and there would be no reason for implanting the fluorine. Once again, the only purpose of the fluorine taught by Cheng, *et al.* is to increase the thickness of the later formed liner.

Cheng, *et al.* does not teach or suggest implanting F₂ into an upper corner of an STI oxidation liner, and it is respectfully submitted that claim 1 is allowable over the references of record. Further, Cheng, *et al.* does not teach or suggest implanting F₂ "in sufficient amounts to

affect reduction of negative bias temperature instability and enhance gate oxidation at the STI corner after a high density plasma fill."

Claims 2-10 each depend from claim 1 and add further limitations. It is respectfully submitted that these dependent claims are allowable by reason of depending from an allowable claim as well as for adding additional limitations.

In view of the above, Applicant believe the claims are now in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Ira S. Matsil, Applicants' attorney at 972-732-1001 so that such issues may be resolved as expeditiously as possible. No fee is believed due in connection with this filing. However, should one be deemed due, the Commissioner is hereby authorized to charge Deposit Account No. 50-1065.

Respectfully submitted,



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3/16/04

Date

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